Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

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1031102628

COMPUTER SCIENCE **9608/11**

Paper 1 Theory Fundamentals **May/June 2019**

1 hour 30 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
No marks will be awarded for using brand names of software packages or hardware.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The maximum number of marks is 75.

This document consists of **13** printed pages and **3** blank pages.

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1 Devices connected to the Internet have IP (Internet Protocol) addresses.

(a) Three IPv4 addresses are given.

Circle either Valid or Invalid to indicate whether each address is valid or invalid. Explain your decision.

Address 1: 3A.21.2H.1 Valid / Invalid

Explanation .....

.....

Address 2: 299.53.2.2 Valid / Invalid

Explanation .....

.....

Address 3: 192.2.1.0 Valid / Invalid

Explanation .....

.....

[3]

(b) A website can be accessed using either the Uniform Resource Locator (URL) or the IP address.

Describe how a URL is converted into its matching IP address.

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..... [3]

(c) People use the Internet to stream media.

Complete the following statements by filling in the names of the missing methods of bit streaming.

..... bit streaming is used when watching a live stream of events that are currently taking place. The event is captured live with a video camera connected to a computer, and it cannot be paused or rewound.

..... bit streaming is used when watching an event that has taken place in the past. Existing media are encoded to bit streaming format and uploaded to a server. It can be paused and rewound.

[2]

(d) A recording of a concert is stored as a file. The file is compressed using lossy compression before it is streamed to users.

(i) State why this file needs to be compressed.

.....

..... [1]

(ii) Define the term **lossy compression**.

.....

..... [1]

(iii) The file could be compressed using lossless compression.

Explain why lossy compression is a more appropriate compression technique than lossless for this file.

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..... [3]

2 A software company produces software and distributes it under different software licences.

(a) Four descriptions of software licences are given.

Write the type of software licence that best fits each description. Use a different type of licence for each description.

1. The software can be legally used, only after a fee has been paid.

Licence type .....

2. The source code comes with the software. If the software is modified, the edited source code must be released under the same conditions as the original software.

Licence type .....

3. The software is free for a trial period and then a fee is requested, or expected, if the user wants to continue to use the software.

Licence type .....

4. The source code comes with the software. The software is free to be downloaded, edited, and distributed, possibly without restriction.

Licence type .....

[4]

(b) The software company stores information about customers and the software licences they have purchased. The company considers a file-based approach for the storage and retrieval of data.

(i) Give **three** limitations of a file-based approach to store the data.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(ii) The software company decides to use a database to overcome the limitations of a file-based system. Some of these limitations are addressed through the logical schema.

Name **and** describe **two** levels of the schema of a database.

Name 1 .....

Description .....

.....

Name 2 .....

Description .....

.....

[4]

(c) The database has the following tables:

```
CUSTOMER(CustomerID, CompanyName)

SOFTWARE(SoftwareID, SoftwareName, OperatingSystem, Description)

LICENCE(LicenceID, CustomerID, SoftwareID, DateOfPurchase,
        LicenceType, Cost, ExpiryDate)
```

(i) Identify the type of relationship that exists between the tables `CUSTOMER` and `LICENCE`.

.....

..... [1]

(ii) Describe how the relationship is created between the tables `CUSTOMER` and `LICENCE`.

.....

.....

.....

..... [2]

(iii) The company needs a list of all software licences that have an expiry date on or before 31/12/2019.

Write an SQL query to return the fields `CustomerID`, `SoftwareID`, `LicenceType`, `Cost` and `ExpiryDate` for all licences that expire on, or before 31/12/2019. Group the output by `CustomerID`, and in ascending order of cost.

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..... [5]

3 Kimmy has written a program in a high-level language.

(a) Kimmy has used library routines in the program.

(i) Describe **two** advantages of using library routines in the program.

1 .....

.....

.....

.....

2 .....

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.....

[4]

(ii) Describe what is meant by a **Dynamic Link Library** (DLL).

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..... [2]

(b) Three translators are compilers, interpreters, and assemblers.

(i) State **one** benefit of Kimmy using an **interpreter** during the development of the program.

.....

..... [1]

(ii) State **three** benefits of Kimmy using a **compiler** when the program is complete.

1 .....

.....

2 .....

.....

3 .....

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[3]

4 A software developer works in a team for a large software development company.

(a) Two principles of the ACM/IEEE Software Engineering Code of Ethics are:

- developers must act consistently with the public interest
- developers must act in the best interest of their client and employer.

Name **and** describe **three** other principles in the ACM/IEEE Software Engineering Code of Ethics.

Principle 1 .....

Description .....

.....

.....

Principle 2 .....

Description .....

.....

.....

Principle 3 .....

Description .....

.....

.....

[6]

(b) The software development company uses data backup and disk-mirroring to keep their data secure.

Explain how data backup and disk-mirroring allow the company to recover from data loss.

Data backup .....

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.....

.....

Disk-mirroring .....

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.....

.....

[4]

5 A simple program written in assembly language is translated using a two-pass assembler.

(a) The table contains some of the tasks performed by a two-pass assembler.

Tick (✓) **one** box in each row to indicate whether the task is performed at the first or second pass. The first row has been completed for you.

Task	First pass	Second pass
Creation of symbol table	✓	
Expansion of macros		
Generation of object code		
Removal of comments		

[2]

(b) The processor's instruction set can be grouped according to their function. For example, one group is modes of addressing.

Identify **two** other groups of instructions.

1 .....

.....

2 .....

.....

[2]

(c) The table shows assembly language instructions for a processor which has one general purpose register, the Accumulator (ACC), and an Index Register (IX).

Instruction		Explanation
Op code	**Operand**	
LDM	#n	Immediate addressing. Load the denary number n to ACC.
LDD	<address>	Direct addressing. Load the contents of the location at the given address to ACC.
LDX	<address>	Indexed addressing. Form the address from <address> + the contents of the Index Register. Copy the contents of this calculated address to ACC.
LDR	#n	Immediate addressing. Load the denary number n to IX.
STO	<address>	Store contents of ACC at the given address.
ADD	<address>	Add the contents of the given address to ACC.
INC	<register>	Add 1 to the contents of the register (ACC or IX).
CMP	#n	Compare contents of ACC with denary number n.
JPE	<address>	Following a compare instruction, jump to <address> if the compare was True.
JPN	<address>	Following a compare instruction, jump to <address> if the compare was False.
JMP	<address>	Jump to the given address.
OUT		Output to screen the character whose ASCII value is stored in ACC.
END		Return control to the operating system.

The current contents of the main memory, Index Register (IX) and selected values from the ASCII character set are:

Address	Instruction
20	LDM #0
21	STO 300
22	CMP #0
23	JPE 28
24	LDX 100
25	ADD 301
26	OUT
27	JMP 30
28	LDX 100
29	OUT
30	LDD 300
31	INC ACC
32	STO 300
33	INC IX
34	CMP #2
35	JPN 22
36	END
...	
100	65
101	67
102	69
103	69
104	68
...	
300	
301	33
IX	0

ASCII code table (Selected codes only)

ASCII Code	Character
65	A
66	B
67	C
68	D
69	E
97	a
98	b
99	c
100	d
101	e

Trace the program currently in memory using the following trace table. The first instruction has been completed for you.

Instruction address	ACC	Memory address							IX	OUTPUT
		100	101	102	103	104	300	301		
		65	67	69	69	68		33	0	
20	0									

[8]

6 A student records a video using a digital camera.

(a) The recording uses interlaced encoding.

Describe **interlaced encoding**.

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..... [3]

(b) State **one** benefit of using interlaced encoding compared to progressive encoding.

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..... [1]

(c) A video can be compressed using spatial redundancy or temporal redundancy.

Explain how **temporal redundancy** compresses a video.

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..... [2]

(d) A sound track is recorded for the video.

(i) Describe how a computer encodes the sound track.

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..... [3]

(ii) Explain how the sampling rate and sampling resolution affect the file size of the sound track.

Sampling rate .....

.....

Sampling resolution .....

.....

[2]

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